SYSTEMS, DEVICES, AND METHODS FOR LOWERING DENTAL X-RAY DOSAGE INCLUDING FEEDBACK SENSORS

The present application constitutes a continuation of U.S. patent application Ser. No. 14/201,386, entitled SYSTEMS, DEVICES, AND METHODS FOR LOWERING DENTAL X-RAY DOSAGE INCLUDING FEEDBACK SENSORS, naming Roderick A. Hyde, Edward K. Y. Jung, Jordin T. Kare, Tony S. Pan, Charles Whitmer, Lowell L. Wood, Jr. as inventors, filed 7, Mar., 2014, which is currently co-pending or is an application of which a currently co-pending application is entitled to the benefit of the filing date.

If an Application Data Sheet (ADS) has been filed on the filing date of this application, it is incorporated by reference herein. Any applications claimed on the ADS for priority under 35 U.S.C. §§119, 120, 121, or 365(c), and any and all parent, grandparent, great-grandparent, etc. applications of such applications, are also incorporated by reference, including any priority claims made in those applications and any material incorporated by reference, to the extent such subject matter is not inconsistent herewith.

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is related to and/or claims the benefit of the earliest available effective filing date(s) from the following listed application(s) (the "Priority Applications"), if any, listed below (e.g., claims earliest available priority dates for other than provisional patent applications or claims benefits under 35 USC §119(e) for provisional patent applications, for any and all parent, grandparent, great-grandparent, etc. applications of the Priority Application(s)). In addition, the present application is related to the "Related Applications," if any, listed below.

Priority Applications

None

If the listings of applications provided above are inconsistent with the listings provided via an ADS, it is the intent of the Applicant to claim priority to each application that appears in the Priority Applications section of the ADS and to each application that appears in the Priority Applications section of this application.

All subject matter of the Priority Applications and the Related Applications and of any and all parent, grandparent, great-grandparent, etc. applications of the Priority Applications and the Related Applications, including any priority claims, is incorporated herein by reference to the extent such subject matter is not inconsistent herewith.

SUMMARY

In an aspect, the present disclosure is directed to, among other things, an intra-oral x-ray imaging system. In an embodiment, the intra-oral x-ray imaging system includes an intra-oral x-ray sensor configured to acquire intra-oral x-ray image information associated with a patient. In an embodiment, the intra-oral x-ray imaging system includes an x-ray beam limiter assembly including a controllable x-ray collimator module. In an embodiment, the controllable x-ray collimator module includes an x-ray beam collimation adjustment mechanism that is responsive to one or more inputs including information associated with a border position of the intra-oral sensor. In an embodiment, the intra-oral x-ray imaging system includes an x-ray beam limiter assembly configured to adjust an x-ray beam field of view. In an embodiment, the intra-oral x-ray imaging system includes an x-ray collimator module operably coupled to the intra-oral x-ray sensor and the x-ray beam limiter assembly. In an embodiment, the x-ray collimator module is configured to adjust an x-ray beam field of view responsive to one or more inputs including information associated with a border position of the intra-oral sensor. In an embodiment, the intra-oral x-ray imaging system includes an x-ray beam limiter assembly having one or more shutters (e.g., spring-loaded shutters, solenoid activated shutters, relay device activated shutters, electro-mechanical shutters, etc.). In an embodiment, during operation, the x-ray collimator module is configured to vary a shutter aperture associated with at least one of the one or more shutters responsive to the one or more inputs. In an embodiment, the intra-oral x-ray imaging system includes an x-ray beam limiter assembly having one or more aperture diaphragms. In an embodiment, during operation, the x-ray collimator module is configured to vary a diaphragm aperture of the one or more aperture diaphragms responsive to one or more inputs including information associated with a border position of the intra-oral sensor.

In an aspect, the present disclosure is directed to, among other things, an intra-oral x-ray imaging device. In an embodiment, the intra-oral x-ray imaging device includes circuitry configured to determine a position (e.g., location, spatial placement, locality, spatial location, physical location, physical position, etc.) or an orientation (e.g., angular position, physical orientation, attitude, etc.) of an intra-oral x-ray sensor. In an embodiment, the intra-oral x-ray imaging device includes circuitry configured to adjust an x-ray beam field of view responsive to one or more inputs from the circuitry configured to determine the position or orientation of the intra-oral x-ray sensor. In an embodiment, the intra-oral x-ray imaging device includes circuitry configured to acquire intra-oral x-ray image information associated with a patient. In an embodiment, the intra-oral x-ray imaging device includes circuitry configured to generate one or more parameters associated with a field of view setting.

In an aspect, the present disclosure is directed to, among other things, an intra-oral x-ray imaging method. In an embodiment, the intra-oral x-ray imaging method includes automatically determining an intra-oral x-ray sensor border position and an intra-oral x-ray sensor orientation. In an embodiment, the intra-oral x-ray imaging method includes varying an x-ray beam field of view parameter (e.g., a field of view size, a diameter dimension, a field of view position parameter, an x-ray field collimation parameter, etc.) responsive to one or more inputs including information associated with the intra-oral x-ray sensor border position and the intra-oral x-ray sensor orientation. In an embodiment, the intra-oral x-ray imaging method includes acquiring intra-oral x-ray image information associated with a patient. In an embodiment, the intra-oral x-ray imaging method includes generating at least one parameter associated with an x-ray imaging mode (e.g., adult panoramic mode, child panoramic mode, high-dose-rate mode, low-dose-rate mode, moderate-dose-rate mode, mandible mode, occlusion mode, maxillary mode, panoramic mode, pulsed fluoroscopy mode, temporomandibular joint mode, etc.) responsive to automatically determining the intra-oral x-ray sensor border position and the intra-oral x-ray sensor orientation. In an embodiment, the intra-oral x-ray imaging method includes varying an x-ray beam aim parameter responsive to automatically determining the intra-oral x-ray sensor border position and the intra-oral x-ray sensor orientation.